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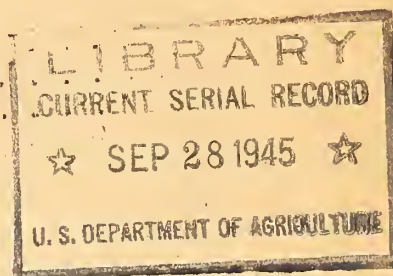
R E P O R T

of the

FIRST NORTHEASTERN CORN IMPROVEMENT CONFERENCE

(Organization Meeting)

New Haven, Connecticut
February 2-3, 1945



Reported by
Merle T. Jenkins, Secretary

Mimeographed by
Division of Cereal Crops and Diseases
Bureau of Plant Industry, Soils, and Agricultural Engineering
Plant Industry Station, Beltsville, Md.
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REPORT OF THE FIRST NORTHEASTERN CORN IMPROVEMENT CONFERENCE

Connecticut Agricultural Experiment Station, New Haven, Connecticut
February 2-3, 1945

Reported by Merle T. Jenkins 1/ Secretary

INTRODUCTION

Research workers interested in the improvement of field and sweet corn in the Northeastern States have felt for some time that they would profit materially from regional conferences of the interested workers and better coordination of the corn improvement programs in progress within the region. Dr. D. F. Jones has been especially active in promoting the idea of organizing a Northeastern Corn Improvement Conference. At the meeting of the Directors of the Northeastern States held on May 23, 1944, the Directors approved the calling of a corn conference and appointed Director W. L. Slate as Referee to represent all the States.

An attempt was made to arrange a meeting late in the spring of 1944 but due to the various difficulties of the times it finally was postponed. Arrangements for the present meeting were made by Dr. Jones and other members of the staff of the Connecticut Agricultural Experiment Station after correspondence with the workers interested in attending the conference. Notice of the meeting was sent to the research workers in the Northeastern States and in adjoining States and Canadian Provinces by D. F. Jones, W. R. Singleton, and O. E. Nelson, Jr. The Experiment Station Directors were advised of plans for the conference by Director Slate.

The purpose of the New Haven conference as outlined in the notice of the meeting was to consider problems of corn improvement primarily concerned with genetics and to develop a coordinated program of corn research in the northeastern area that will promote the production of corn hybrids with as wide usefulness as possible. Participation in the meeting was limited to Experiment Station and Federal staff members.

1/ Principal Agronomist, Division of Cereal Crops and Diseases, Plant Industry Station, Beltsville, Maryland.

AFTERNOON MEETING, FRIDAY, FEBRUARY 2

The Conference met in Britton Auditorium at the Connecticut Agricultural Experiment Station. The meeting was called to order at 2:00 p.m. by D. F. Jones. Dr. Jones reviewed the developments that had led to the calling of the conference. He suggested that the group proceed with the organization of a Northeastern Corn Improvement Conference and suggested the election of officers as the first item of business. The following officers were elected:

Chairman	- D. F. Jones
Vice Chairman	- L. L. Huber
Secretary	- M. T. Jenkins

Dr. Jones then proceeded to call individually on each of the workers present and asked them to summarize the corn improvement investigations in progress at their respective experiment stations. Brief summaries of these reports are given below. The reports of the different workers are grouped alphabetically by states, rather than in the order in which they were given.

REPORTS OF CORN IMPROVEMENT INVESTIGATIONS

CONNECTICUT

CONNECTICUT AGRICULTURAL EXPERIMENT STATION, New Haven

W. R. Singleton. All sweet corn in Connecticut is grown for the green corn market, and the very early corn always commands a premium price. Consequently in our breeding work considerable attention has been paid to the early types. We have become quite "maturity conscious", and have divided the season into seven arbitrary classes: Very Early, Early, Early Midseason, Midseason, Late Midseason, Late and Very Late, with a 3 to 5 day spread between each season. Hybrids have been developed for most of these seasons. These hybrids, if planted at one time, will provide a succession of sweet corn for three weeks to a month. One such succession is Spancross, Marcross, Carmelcross, Lincoln, Golden Cross, and Wilson, all Connecticut hybrids except Golden Cross.

A naming system to show the relative maturity of any named hybrid has been developed using different periods of American History to denote the maturity of any given hybrid. The earlier the American Historical name, the earlier the hybrid. The first hybrids using this system were Lexington (early), Lincoln and Lee (midseason). We now have an Old Hickory (Early midseason) and a Wilson (Late). This system has been generally accepted by the gardeners and seed trade.

Purdue 39 mutated to C30, a reduced plant type but normal in growth. Surprisingly P39 x C30 shows hybrid vigor over the larger parent

P39. Also C30 when outcrossed to unrelated inbreds gives more hybrid vigor than comparable P39 crosses.

Two sub lines of an inbred, C31-1 and C31-2, when crossed give a surprising amount of hybrid vigor, almost as much as would be expected from crossing two unrelated inbreds. Both these lines have the same breeding. They were derived by crossing Late Mammoth x P39 and back-crossing three times to P39, selecting for a larger plant and ear. The lines have been separated since 1939. It seems hardly likely that the progenitor of these two lines was sufficiently heterozygous for heterotic factors to allow segregation for genes that would give as much heterosis as is manifest in the hybrid 31-1 x 31-2. Possibly the two lines have mutated or "diverged" so that considerable heterosis is obtained when the two are crossed. This explanation could apply to the P39xC30 cross and is in line with East's 1936 hypothesis.

Maize breeders, working with extensive material, have from time to time many opportunities to make worthwhile contributions to the interpretation of heterosis. This should be one of our functions as well as turning out improved varieties.

A recent survey of Connecticut sweet corn hybrids shows that about 2-1/4 million pounds of seed was produced last year. This is more than double the amount produced in 1941, the year in which the last survey was made.

Oliver E. Nelson, Jr. Much of the effort in the field corn breeding program here at Connecticut has been directed to the study of Western inbreds in their combination tests. Tests made in 1943 and 1944 have shown that the Lancaster inbreds L317 and Ohio 40B are necessary for maximum yield. The single cross L317 x 40B would make an excellent pollen parent for use in making double crosses. The other inbred which these tests have shown to be most valuable in producing yields in the theoretical double crosses has been Indiana WF9. Three or four other inbreds such as Iowa I 159, Indiana P8 and CI.187-2 combine well with these other three in double crosses. The projected test for 1945 has dropped some of the lines which experience has shown to be least valuable under our conditions such as 38-11 and Os420. These have been replaced by such lines as A, CC35 and 27.

An inbreeding project has been carried on here at the station for the last seven years. The open-pollinated varieties in which selections were made were Lancaster Surecrop, Ohio, Pennsylvania, Somerset and Patton Leaming, Golden Queen and several Yellow Dents from the Eastern shore. Of this group the variety most productive of inbreds which seem to be worth while is Lancaster Surecrop, from which four good lines have been derived. One of these in particular is outstanding, 1016-215, which has the ability to tolerate normal infestations of corn borers without breakage. The root system was strong enough to withstand

the 1944 hurricane. These characteristics are transmitted to single crosses involved in this line. The other Lancaster lines are valuable chiefly because of increased yielding capacity in hybrids.

R. B. Friend. The European corn borer has been very destructive to sweet corn in Connecticut. Growers can afford to spend \$35 to \$40 per acre on control measures. Various characters influencing the differences among strains in resistance to the borer have been studied. The possibilities of controlling the borer with insecticides also has been studied and practical control methods have been developed. These are, of course, subject to improvement.

N. Turner discussed studies of insect resistance. The program planned for the future will include studies of various plant characters associated with insect resistance. Susceptibility to the European corn borer apparently is increased in the presence of excess amounts of corn pollen. Studies of insect attractiveness also are planned.

DELAWARE

DELAWARE AGRICULTURAL EXPERIMENT STATION, Newark

C. E. Phillips. No corn breeding program is in progress at the Delaware Station. The Station has been testing promising hybrids and is interested in testing any new combinations that may be adapted to the State.

MAINE

MAINE AGRICULTURAL EXPERIMENT STATION, Orono

R. M. Bailey. Sweet corn for canning has been one of the principal crops in Maine for many years. Climatic factors favor large yields and high quality. Disease and insect pests are less troublesome than in most production areas. The short and relatively cool growing season creates a special problem with respect to varieties. Golden Cross Bantam is too late in maturity for most Maine farms. The principal objectives in the sweet corn breeding program at the Maine Station are earliness, high canning quality, and heavy yield. Hybrid seed for about one-third of the acreage is produced by the Maine Cannery Association with technical assistance provided by the Maine Station in return for funds providing a graduate fellowship. Better than 90% of the canning acreage is hybrid. Most of the hybridized seed consists of top crosses (a local 12-16 rowed yellow canning strain crossed with Purdue 1339 or Maine 100),

Maine Tricross and lesser amounts of Seneca Golden, Carmelcross and Golden Cross.

Some attention is being devoted to the development of early garden hybrids. Early Golden 1.13 (Conn.4 x Me.1) and Northland (Smith Golden Bantam x Conn.4) are two of local interest.

Corn for grain is a minor crop in Maine but war time feed shortages have stimulated greater interest in home grown feeds. The short growing season has limited farmers to the use of early maturing sorts, principally local flint strains. Trials at the Maine Station of recently developed flint-dent and early dent hybrids show some of these to be well adapted. The use of Maine B (Wisc.240) seed, produced in this area under supervision of the Maine Station, is rapidly gaining in popularity and may help to preserve the revived interest in field corn as the yield averages fully 25% greater than from local flints. A program for testing new early hybrids, for production of Maine B (Wisc.240) seed, and to develop early inbreds is in progress at the Maine Station.

Several thousand acres of silage corn are grown annually. For this purpose, hybrids of Cornell 29-3 season are recommended for most conditions and Maine B, if earlier maturity is desired.

MARYLAND

MARYLAND AGRICULTURAL EXPERIMENT STATION, College Park

R. G. Rothgeb. The present efforts with regard to field corn breeding in Maryland began about ten years ago as a result of the growing success of hybrid corn in the Corn Belt of the Central West. Since a large part of Maryland has varietal requirements very similar to those found in parts of the Corn Belt, the first job was to learn what hybrids already established in those areas could be used to advantage. Accordingly, as many replicated field tests were set up as could be handled by the staff. Paralleling the test work, an inbreeding program was initiated for the purpose of supplementing existing inbred lines with new lines obtained from popular open-pollinated strains that had been carried in the state for years.

Although the program has not been as extensive and intensive as desired, and although, as yet, it has not produced any new hybrids, it has paid dividends. The annual tests have made possible the recommending of good hybrids for the greater portion of the State. At the present time about 60 percent (300,000 acres) of the State's corn acreage is being planted to hybrids, and most of this hybrid acreage is being planted to numbers that made good records in station tests before being accepted by Maryland farmers. U.S. 13 and Illinois 448 together with related hybrids occupy the major portion of the hybrid acreage. Iowa 939 has been a

consistent performer, but is too early for central and eastern Maryland where most of the State's corn crop is grown. Because of the reliable performances of the above-named hybrids, they are being used in all tests as standards of comparison in their respective maturity groups.

Although the hybrid corn acreage in Maryland is expanding at about the same annual rate as was experienced by the Corn-Belt states, as a whole, there is still need for better hybrids and for hybrids better suited to the many localized requirements encountered in a State that varies so widely with regard to both crop environment and type of farming. In order to take care of elevations ranging from sea level on the east to 2,500 feet for a mountain plateau some 150 miles to the west, it is necessary to have hybrids late enough for northern Alabama and others early enough for northern Wisconsin.

Also acceptable numbers must be able to cope with drought, a wide range of soil types and fertility levels together with most of the Corn Belt diseases and insects. Superimpose upon all of these environmental requirements the diverse and changing demands of the farmer for type and quality and it becomes apparent that corn breeding is not a finished job in Maryland.

At the present time the Maryland Station is carrying breeding and testing programs for both field corn and sweet corn with methods and objectives being quite similar. Although the sweet corn program is the older of the two, it is now less extensive. For both crops a number of local inbreds are being tested in experimental crosses. If any of them should survive our own elimination trials we would be glad to submit them for final evaluation in cooperative uniform single cross tests. We believe that this is the proper approach for determining the general worth of an inbred line. Furthermore, we believe that there are a number of other hybrid corn problems that can best be settled by interstate cooperation. In so far as a very much depleted personnel will permit, I believe that our station will participate in such efforts.

MASSACHUSETTS

MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION, Amherst

W. G. Colby discussed the relation of soil fertility to crop production. He emphasized that the large yields produced by corn hybrids require large amounts of plant food. The soils of the Northeast are naturally low in fertility and unless fertilizer practices are followed which will provide the necessary quantities of plant food the yield performance of all hybrids will be disappointing.

H. M. Yegian. The Corn Improvement Program at the Massachusetts Agricultural Experiment Station has for its purpose the production

of strains of hybrid corn which will be suitable for both grain and fodder in our areas of high elevation. Most of the hybrids introduced by Mid-western Agricultural Experiment Station are best adapted for silage purposes in our State. There is, however, a definite need for early maturing hybrids in the class of early Butler or Cornell 11.

We have received material and valuable help from Dr. D. F. Jones and other workers connected with the agricultural experiment stations. We therefore believe that a coordinated program for research in corn improvement in the Northeastern States will be very advantageous to all concerned.

W. H. Lachman. Much of the sweet corn breeding program is given to the testing of hybrid varieties and experimental crosses. Since little or no sweet corn is canned commercially in this State the bulk of the corn is raised for fresh consumption. Practically all of the corn sold wholesale is put up in the standard farm, bushel box with five dozen ears in a box-. Early-maturing corn sells at a premium, particularly if it is free of borers. Many growers are aware of the benefits of pre-cooling and icing and once the consumer learns what good quality is in sweet corn he will not be anxious to pay a good price for corn of inferior quality.

The hybrids that are apt to meet with most favor as far as Massachusetts markets are concerned, therefore, would probably be early in maturity, resistant to borer attacks, and produce a high yield.

They should produce thick heavy ears, cylindrical in shape, eight inches long with at least twelve rows of golden yellow kernels.

A few varieties meet most of the specifications outlined here and this is especially true of Marcross. There is a feeling, however, that more attention should be paid to quality, both from the standpoint of flavor and tenderness of the kernels.

NEW HAMPSHIRE

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION, Durham

Leroy J. Higgins. Since a small department of Agronomy with a limited personnel must cover many phases of agronomy, the New Hampshire station has confined its corn work to variety trials. In New Hampshire the growing season ranges from 90 days in the north to 135 to 140 days in the southeastern seacoast area. Less than one-fourth of the corn acreage grows corn for grain, while most of the corn is harvested early before frost for silage purposes.

In 1936 corn variety trials were initiated to find out which varieties and new hybrids were best adapted for New Hampshire. Since that time many strains of local flints, out-of-state flints, dents, dent-flint hybrids and dent hybrids have been tried. Each seed lot has been grown in at least triplicate each season in randomized plots and for no less than three seasons.

The first six years or so were used to find out the best local strains and varieties that were being grown in the State. During this period a limited number of the new hybrids were brought in. Fortunately "New Hampshire 500" a dent corn selected out of Minnesota 13 around 1910 was located again. This open-pollinated variety has yielded right up with the best of the new dent hybrids during the past 5 or 6 seasons.

As a result of our trials the following are recommended:

I. Silage:

1. Early maturing - Cornell 29-3
2. Late maturing - W. B. Sweepstakes

II. Grain:

1. Very early - Local flints
2. Early - Maine Hybrid B
3. Medium - "N. H. 500" Minhybrid 800 and 700 Series, Michigan 51B, Wisconsin 335
4. Late - Cornell 29-3

When the World War is over and the station staff is at full strength, New Hampshire will be in a better position to cooperate in uniform trials and to carry on a better program of corn improvement.

NEW JERSEY

NEW JERSEY AGRICULTURAL EXPERIMENT STATION, New Brunswick

J. C. Anderson. The European corn borer is one of our major problems in New Jersey. None of the hybrids grown in the State show any appreciable resistance. Attempting to include some corn borer resistance or tolerance along with lodging resistance, high yields, etc., constitutes our field corn breeding program. In our sweet corn program we are interested in evaluating varieties as to their keeping qualities after picking. The breeding program is proceeding along the usual lines of increasing quality, uniformity, yield, disease resistance and insect resistance, mostly in the earlier sweet corns. In both programs we are interested in extensive exchange of breeding material and also in co-operative uniform testing of single crosses which merit such consideration.

NEW YORK

NEW YORK AGRICULTURAL EXPERIMENT STATION, Ithaca.

R. G. Wiggans. In the earlier years of the breeding program the emphasis was placed almost entirely on the development of silage hybrids. When the breeding program was started, approximately 80 percent of the corn in New York was grown for silage and 20 percent was grown for grain. Recently the proportion of the corn acreage grown for grain has been greatly increased. Some of the hybrids developed for silage have been very satisfactory for grain production. At the present time a major portion of the emphasis is devoted to the development of strains that will be suitable for grain production.

This work includes: (a) development of new inbreds; (b) testing of F_1 s in the evaluation of inbreds; (c) testing of large numbers of double crosses at the Experiment Station; (d) testing of promising double crosses in regional trials; (e) testing of promising commercial double crosses in regional trials with emphasis on known formula hybrids; (f) the development of a double cross flint for high elevations.

L. F. Randolph. All of the ten trisomes of corn now have been identified and isolated. Different trisomic ratios are obtained for each of the chromosomes, the larger chromosomes being transmitted through the egg with a higher frequency than are the shorter chromosomes. N plus 1 gametes rarely are transmitted through the pollen.

The position of the centromere or spindle attachment region has been located tentatively on the linkage maps of each of the corn chromosomes with the aid of the translocation stocks of E. G. Anderson. Translocations also are being used to locate the physical position of the genes in the chromosomes.

Tetraploid corn produced from various hybrid combinations of commercial lines has marked hybrid vigor, a very sturdy growth habit and resists lodging to an unusual degree. Certain hybrids are highly fertile but most of them are partly sterile. Studies of the effect of tetraploidy on chemical composition have shown that certain tetraploids contain more carotin and protein than comparable diploids.

L. J. Tyler discussed the importance of corn diseases in New York and indicated an interest in cooperating on any regional disease studies.

R. L. Cushing. Genetic stocks of maize are being propagated and seed is being maintained by the Maize Genetics Cooperation. A start has been made in transferring usable genetic markers to the ten trisomes, so that the trisomes will be more useful to those who do not have the facilities for cytological work. Contributions of new genetic stocks are welcome, and items of interest to maize breeders and geneticists are solicited for the annual News Letter.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, Geneva

John Shafer, Jr. A number of different divisions of the Geneva Experiment Station are doing research on sweet corn. Very little work is done here on field corn. The Division of Vegetable Crops is working on breeding and fertilizers, and in cooperation with the Division of Entomology is studying the resistance of various varieties and strains to the corn borer. The breeding program has three goals at the present time: (a) a variety of Golden Cross quality and yield, but about one week earlier; (b) a variety of Golden Cross quality and equal or higher yield, but about one week later; (c) a non-tillering variety with Golden Cross quality and yield (this last is carried on with an eye to the coming of mechanical picking). The fertilizer work involves the determination by field trials of the best fertilizer for sweet corn and of the best way of applying the fertilizer. The corn borer work is at present a survey of different varieties, hybrids and inbreds. If marked resistance is found a breeding program will be begun.

The Division of Plant Pathology is studying the effect of various seed treatments on seed decay and germination. Observations are also being made on the effect of various corn borer sprays on the incidence of smut.

The Seed Laboratory continually determines the purity and germination of commercial seed stocks, and from time to time checks the trueness to type of commercial sweet corn varieties.

The Division of Entomology is studying the control of corn borer and corn earworm by the application of insecticides.

The Division of Chemistry has under way several studies involving sweet corn. One concerns the effect of stage of development on the quality of frozen corn on the cob. Another is a study of methods of blanching corn preliminary to freezing or dehydration. A third is a study of dehydration at different temperatures, and from the frozen state in a vacuum.

OHIO

OHIO AGRICULTURAL EXPERIMENT STATION, Wooster

G. H. Stringfield. Cultural practices as related to the growing of hybrid corn are being reviewed and emphasized at the present time. Studies of the relation of stand to yield indicate that optimum stands for most hybrids are 1,800 to 2,000 plants per acre higher than for the open-pollinated varieties. Fertilizer studies indicate that hybrids can efficiently use more fertilizer than the open-pollinated varieties. We are interested in isolating lines that will tolerate more fertilizer than present lines.

Methods of growing inbred lines are being studied to determine the best method of propagating them. More attention also is being paid to the selection of vigorous lines, easily propagated. Effort is being directed toward the concentration of desirable characters in particular lines. The past season greatly emphasized the need for drought resistance.

Another important problem receiving attention is the selection of strains especially suited to mechanical harvesting. Mechanical harvesting has increased greatly and farmers are much interested in good "picker corns".

Close cooperation has been maintained with plant pathologists and entomologists in efforts to improve disease and insect resistance. Participation in the uniform tests of single crosses has been one of the most profitable activities in recent years. At the present time there is urgent need for some earlier lines.

ONTARIO

CENTRAL EXPERIMENTAL FARM, Ottawa

Fred Dimmock. Corn growing and the use of hybrid corn has been increasing in importance in Canada in recent years, particularly in the province of Ontario. The Dominion Government conducts corn breeding programs on three experiment stations, two of which are located in Ontario, at Harrow and Ottawa, and the other in Manitoba, at Morden.

Close cooperation is maintained between these three stations and Wisconsin and other Corn Belt Stations. Lines have also been exchanged with Minnesota and the Dakotas.

PENNSYLVANIA

PENNSYLVANIA AGRICULTURAL EXPERIMENT STATION, State College

L. L. Huber. The corn breeding program of the Pennsylvania Agricultural Experiment Station is conducted by the Departments of Agronomy, Botany, and Zoology and Entomology, cooperating.

The breeding program is concerned not only with yield but also causes of differentials in yield. Environmental factors that appear to influence performance of a strain are measured quantitatively. As far as possible the breeding program is synthesized with other agronomic practices necessary in efficient corn production. Productivity level, rate of planting and the influence of insects and disease are included in the synthesized studies of performance.

The development of pathological and entomological methods that may aid in developing less susceptible strains is a major part of the breeding program. These studies are concerned primarily with corn leaf blight, stalk rot, Japanese beetle, European corn borer and corn leaf aphid.

B. F. Coon discussed the cooperation in connection with the entomological phases of the breeding program at Lancaster where he is stationed. Data were obtained in 1944 on relative leaf injury by the European corn borer and on injury by Japanese beetles.

C. C. Wernham discussed the development of methods of rating disease injury and methods of insuring the presence of disease every season. *Helminthosporium* leaf blight, ear rots and stalk rots were studied in 1944. Injury by leaf blight was recorded on an individual plant basis in terms of the numbers of lesions occurring on definite leaves. Many lines were not uniform in their disease reaction.

M. T. Lewis discussed the sweet corn breeding program in Pennsylvania.

RHODE ISLAND

RHODE ISLAND AGRICULTURAL EXPERIMENT STATION, Kingston

A. E. Rich. Following is a brief report of the work being done with corn at the Rhode Island Agricultural Experiment Station:

- I. Breeding - none
- II. Field corn
 - 1. Variety trials
 - 2. Rotations
 - 3. Ratios and amounts of fertilizer
 - 4. Fertilizer placement
 - 5. The effect of certain crops on succeeding crops
- III. Sweet corn
 - 1. Variety trials
 - 2. Organic matter studies

U. S. DEPARTMENT OF AGRICULTURE

PLANT INDUSTRY STATION, Beltsville, Md.

Merle T. Jenkins. The heavy natural epidemic of leaf blight in 1942 caused by *Helminthosporium turcicum* emphasized the importance of

breeding for resistance to this disease. As conditions at Plant Industry Station seem to be especially favorable for the development of artificially produced epidemics of this leaf blight, studies of disease resistance and a program of breeding for disease resistance are receiving increased emphasis.

In 1944 a large group of inbred lines and hybrids from the Corn Belt and South were tested under an extremely heavy artificially produced epidemic. Most of the strains tested were susceptible but a few of those included developed only slight to moderate infection.

A group of the more important Corn-Belt lines that are susceptible were crossed with lines which were resistant in the natural epidemic of 1942. Some of the backcross progenies from these crosses grown in 1944 indicated very promising possibilities for transferring resistance to the important Corn Belt lines by repeated backcrossing.

WEST VIRGINIA

WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION, Morgantown

J. L. Cartledge. About one-third of the more than 400,000 acres of corn grown in West Virginia in 1944 was hybrid, and the percentage has been increasing every year. The farmers in many parts of the state are using Corn Belt hybrids, and some of the Ohio hybrids are particularly popular and have given satisfactory performance. A limited breeding program has been in progress for about 10 years, and 6 promising West Virginia hybrids have been released for commercial production. These are mainly the result of substituting one or two West Virginia lines in Corn Belt hybrid combinations. The latest hybrid commonly grown in this state is U.S. 13. New early hybrids are needed for the higher elevations, where northern hybrids have not been satisfactory, possibly because of a length of day relationship.

* * * * *

Following the presentation of station reports W. R. Singleton

MOVED: That the workers interested in field corn and those interested in sweet corn each get together and elect committees to arrange the details for their respective uniform tests.

Seconded and passed.

Meeting adjourned at 4:20 p.m.

Immediately following adjournment the sweet corn breeders and the field corn breeders met separately to select the committees mentioned above. The following committees were selected.

Committee on Uniform Tests of Field Corn

L. L. Huber, Chairman
R. G. Wiggans
D. F. Jones

Committee on Sweet Corn Investigations

W. R. Singleton, Chairman
R. M. Bailey
W. H. Lachman
M. T. Lewis
John Shafer, Jr.
R. S. Snell

EVENING MEETING, FRIDAY, FEBRUARY 2

Dr. Jones and his coworkers arranged for an evening banquet at the Hotel Taft with Dr. G. H. Shull of Princeton University as the principal speaker. The banquet was very well attended and, war-time shortages considered, a delicious meal was served.

Following the banquet Chairman Jones introduced Dr. W. L. Slate, Director of the Connecticut Agricultural Experiment Station.

Director Slate welcomed the group to New Haven and expressed his disappointment at not being able to attend the full sessions of the meeting. He then reviewed the remarkable development and expansion that has come about in agricultural research during the period of his association with it.

Dr. Jones then introduced Dr. Shull and indicated that he would discuss some of his early breeding work relating to hybrid corn.

Dr. Shull stated that when he joined the staff of the Station for Experimental Evolution at Cold Spring Harbor in 1904 he was asked by Dr. Davenport to develop a comprehensive program of research in "experimental evolution" of plants. One phase of this broad program was a study of mutations or hereditary variations and he chose the evening primrose for this phase of the program. Plants were obtained from the same field from which Dr. Hugo De Vries had taken his plants. Seed of De Vries' selfed primroses also were obtained for this study.

A second phase of the general program was a study of "fluctuations" or non-heritable variations. Corn was chosen for this phase of the program and the number of kernel rows on the ear was selected as a suitable "fluctuating" character. In the fall of 1904 the kernel rows

on most of the ears in an entire crib of corn were counted as a preliminary to the selection of the foundation material. Parallel series of ear rows were grown in two groups, those in one group being selfed and those in the other being crossed. It soon was found that with selfing, the material separated into true-breeding but non-vigorous lines apparently unsuited to the original purpose of the program which was a study of non-heritable variations.

Dr. Shull noted that with each successive selfing there was less and less diminution of vigor. He indicated that if he had been interested in corn improvement he doubtless would have thrown the material away at this stage. His interest, however, was in learning what nature was doing so the lines were carried along and crosses were made among them. In these first generation crosses between the inbred strains the vigor lost during inbreeding was regained.

Dr. Shull's first report to the American Breeders Association was given in Washington, D. C. in January 1908. E. M. East was in the audience and immediately wrote Dr. Shull for his manuscript to go over more carefully. The second report to the American Breeders Association was at Columbia, Mo., in 1909. In this report he pointed out the advantage of having uniform progeny such as would follow from crossing uniform parents and indicated how detasseling could be used for mass crossing.

The following year papers by E. M. East and G. N. Collins appeared. Collins suggested bringing in new "blood" each year which Dr. Shull felt would have spoiled the method. East said the method was theoretically sound but impractical. East favored the use of variety crosses.

The third report to the American Breeders Association was given at Omaha, Nebr., in 1910. At that meeting Dr. Shull also had an exhibit of inbred lines and their single crosses which created much interest.

In August 1914, Dr. Shull presented a lecture before the Gesellschaft zur Förderung deutscher Pflanzenzucht at Göttingen, Germany. Because of the war this lecture was not published until 1922. By the time this lecture was presented Dr. Shull had been won over to East's idea that the method was impractical and, much to his present regret, he also advocated the use of first generation crosses between varieties. The word "heterosis" was first used in this lecture but was first published in "Duplicate Genes for Capsule Form in *Bursa bursa-pastoris*" (1914).

MORNING MEETING, SATURDAY, FEBRUARY 3

The separate meetings of the sweet corn breeders and field corn breeders were continued on Saturday morning until shortly after 9:30.

Chairman Jones reassembled the entire group in Britton Auditorium and called the meeting to order at 9:50 a.m. He then presented the lists of lines for uniform tests of five different maturity groups that had tentatively been selected by the group of field corn research workers. These are listed below:

<u>U.S. 13</u> <u>Maturity</u> <u>Group</u>	<u>Iowa 939</u> <u>Maturity</u> <u>Group</u>	<u>Ohio M15</u> <u>Maturity</u> <u>Group</u>	<u>Early Butler</u> <u>Maturity</u> <u>Group</u>	<u>Wis. 240</u> <u>Maturity</u> <u>Group</u>
WF9	N6	Oh51A	M1311	NY2
L317	M14	A	CC4	NY3
Hy	A	A165	CC8	NY4
187-2	CC28	A158	CC14	W15
Oh07	WF9	Ia.153	CC15	W85
I159	I205	Ia82Y	O83	D9
Oh40B	Oh28	Ia63Y	O9	J
P8	CC10	CC22	CC18	
NJ30	CC24	CC28	CC1	
NJ47	Oh51A	CC3	A158	

All of the possible single crosses among the lines in each group were to be prepared in 1945 for use in cooperative uniform tests in 1946. The stations tentatively agreeing to produce seed of each of the five groups were as follows:

1. U.S. 13 group - New Jersey and Maryland
2. Iowa 939 " - Connecticut and Pennsylvania
3. Ohio M15 " - " " "
4. Early Butler" - Massachusetts and New York
5. Wis. 240 " - New York, Maine and Massachusetts

Discussion of the Release and Exchange of Inbred Lines

In discussing arrangements for the preparation of seed for the uniform tests, the widely divergent policies for handling inbred lines in the different states were brought out and the difficulty of handling lines from states which do not permit release to private individuals was mentioned. This led to a general discussion of station policies relating to the release and exchange of inbred lines and Dr. Jones called on representatives from several states to summarize the policy of their station.

J. L. Cartledge explained that West Virginia has not released lines except to other experiment stations. With the development and

commercial production of West Virginia hybrids it now is faced with the problem of producing larger quantities of foundation seed under contract. Methods of handling inbred lines under this increased production will need to be worked out.

D. F. Jones explained that the Connecticut policy has been to release lines to producers when their value has been established.

L. L. Huber indicated that Pennsylvania also expects to release lines to the public when their value has been established. He explained the arrangements that have been made with the Atlantic Seed Stocks Co-operative for producing foundation seed stocks for Pennsylvania.

Several workers emphasized the beneficial effects in promoting a freer interchange of inbred lines among the cooperating stations that would result from the adoption by the Northeastern States of uniform policies for handling the release and distribution of lines. It was decided that a committee should be appointed to formulate a uniform policy on the release and distribution of inbred lines.

Chairman Jones appointed the following as members of this committee: R. G. Wiggans, Chairman, J. C. Anderson, R. G. Rothgeb, M. T. Jenkins.

The committee was instructed to contact all of the states and to formulate a policy to be presented to the Executive Committee for approval. When approved by the Executive Committee the uniform policy is to be presented to the Directors for their approval. The individual states are to be informed of the uniform policy suggested.

Discussion of Methods of Designating Hybrids

The question was raised as to the designation to be assigned to the hybrids predicted from the uniform tests. These combinations will be produced in many states at about the same time. Unless some policy for designating them is developed they will receive numerous state designations and may later enter interstate trade under a number of different designations. If this should happen, the enforcement of the sections of the Federal Seed Act relating to hybrid corn would be greatly complicated.

It was suggested that a committee be appointed to look into the possibility of working out uniform designations for corn hybrids. Chairman Jones indicated that he would designate a committee for this purpose. The following were designated as members of this committee: J. C. Anderson, Chairman, L. L. Huber and R. G. Wiggans.

Discussion of the Statistical Design of Corn Experiments

Dr. C. I. Bliss discussed the relation of statistical design of experiments to the corn testing program, particularly as related to the measurement of quantitative characters such as yield, length of ear, corn borer resistance, etc. He briefly reviewed some of the relative advantages of randomized blocks and the restricted randomized designs such as latin squares, lattice squares, lattices, and triple lattices. The use of covariance in adjusting for variability in stand in conjunction with the lattice designs also was discussed.

Dr. Bliss reviewed the possibilities of collaborative experiments and the difficulties usually encountered in getting cooperators to maintain complete uniformity with regard to entries, replications, methods of recording data, etc., so as to simplify the statistical analysis. Some of the newer methods of obtaining quantitative information on consumer preference on such things as sweet corn quality were briefly mentioned. It was emphasized that comparisons of maturity classes should involve the inclusion of several standards in each experiment and comparisons with these standards.

Other business

R. G. Rothgeb suggested that the Chairman appoint a committee to draw up plans and statistical designs for the uniform comparisons of single crosses. Dr. Huber suggested that Dr. Bliss be a member of that committee. Dr. Jones indicated that such a committee would be appointed after opportunity for consideration of membership. The following were later designated as members of this committee: C. E. Phillips, Chairman, C. I. Bliss and H. M. Yegian.

The possibility of organizing a uniform test of double crosses for 1945 was discussed.

D. F. Jones suggested that the design and the selection of entries for the proposed test of doubles be left to the Committee on Statistical Designs with authority also to specify the records that should be taken.

R. B. Friend discussed insect problems in Connecticut. The importance of the European corn borer in relation to sweet corn was emphasized. The difficulty of obtaining reliable estimates of resistance to the borer was brought out.

N. Turner asked for an expression as to the more important corn diseases of this area. This question was discussed briefly.

R. G. Rothgeb raised a question as to the best methods of recording disease and insect damage. The relative advantage of ratings made on a plot basis versus more detailed records was briefly discussed.

John Shafer brought up the question of breeding for corn borer resistance in sweet corn. He requested expressions of opinion on the possibility of obtaining appreciable resistance as based on the experience of other breeders. In the discussion which followed it was agreed that corn-borer damage is extremely important economically to the canning industry and that the observed strain differences in resistance offer promise from the standpoint of breeding operations.

D. F. Jones discussed the representation of commercial seedsmen in the Northeastern Corn Improvement Conference. He emphasized the close cooperation with seedsmen that had obtained in the past and expressed the desire to do everything possible to maintain it in the future.

M. T. Jenkins described the two kinds of meetings which have become established in the Corn-Belt and Southern corn improvement conferences. The meetings held in conjunction with meetings of the American Society of Agronomy or those of the Southern Agricultural Workers respectively are open to everyone interested. In some of these meetings commercial seedsmen have been specially invited to participate in the program. Alternate meetings usually have been specially called by the experiment station Directors and have been restricted to research and extension workers of the State experiment stations and the Federal Department of Agriculture.

W. R. Singleton discussed the close cooperation that has been maintained with commercial seedsmen in the sweet corn program and the satisfactory manner in which it has worked out.

C. I. Bliss discussed the cooperative arrangements in connection with the extensive pharmacopoeia experiments where a small group meets and plans the experiments and then the cooperator's are invited in to discuss the whole experiment. The difficulty of planning detailed experiments in a large meeting was emphasized.

Other expressions of sentiment were strongly in favor of maintaining the closest possible cooperation with commercial seedsmen. It was appreciated, however, that certain meetings would need to be restricted to small groups of State and Federal workers in order to accomplish the necessary business in a reasonable amount of time.

The time and place of the next meeting was left to the discretion of the Executive Committee.

Meeting adjourned at 11:25 a.m.

ROSTER OF ATTENDANCE

Connecticut	Dr. D. F. Jones Dr. W. R. Singleton Mr. O. E. Nelson, Jr. Dr. C. I. Bliss Dr. R. B. Friend Mr. N. Turner	Agr. Exp. Station	New Haven
Delaware	Prof. C. E. Phillips	College of Agr.	Newark
Maine	Prof. R. M. Bailey	Agr. Exp. Sta.	Orono
Maryland	Dr. R. G. Rothgeb	College of Agr.	College Park
Massachusetts	Dr. W. G. Colby Prof. H. M. Yegian Prof. W. H. Lachman	Mass. State Col., AES	Amherst
New Hampshire	Prof. L. J. Higgins	Univ. of N.H., AES	Durham
New Jersey	Dr. J. C. Anderson	College of Agr.	New Brunswick
New York	Dr. John Shafer, Jr. Dr. R. G. Wiggans Prof. R. L. Cushing Dr. L. F. Randolph Prof. L. J. Tyler	Agr. Exp. Sta. Asso. Prof. Plant Path.	Geneva Ithaca Ithaca Ithaca Ithaca
Ohio	Mr. G. H. Stringfield Dr. G. W. Barber	Agr. Exp. Station USDA Corn Borer Lab.	Wooster 1920 Parkwood, Toledo
Ontario	Mr. Fred Dimmock	Central Exp. Farm	Ottawa, Canada
Pennsylvania	Dr. L. L. Huber Prof. M. T. Lewis Prof. C. C. Wernham Dr. B. F. Coon Mr. B. L. Seem	College of Agr. Col. of Agr., Ent. College of Agr.	State College State College State College Lancaster State College
Rhode Island	Prof. A. E. Rich	Col. of Agr.	Kingston
U. S. D. A.	Dr. M. T. Jenkins	Bur. of Plant Indus.	Beltsville, Md.
Vermont	No representative	College of Agr.	Burlington
West Virginia	Dr. J. L. Cartledge	College of Agr.	Morgantown

OFFICERS AND COMMITTEE MEMBERSHIP, 1945

Officers

Referee - W. L. Slate
Chairman - D. F. Jones
Vice Chairman - L. L. Huber
Secretary - M. T. Jenkins

Committee on Uniform Tests of Field Corn

L. L. Huber, Chairman
R. G. Wiggans
D. F. Jones

Committee on Sweet Corn Investigations

W. R. Singleton, Chairman
R. M. Bailey
W. H. Lachman
M. T. Lewis
John Shafer, Jr.
R. S. Snell

Committee to Formulate a Uniform Policy on
the Release and Distribution of Inbred Lines

R. G. Wiggans, Chairman
J. C. Anderson
R. G. Rothgeb
M. T. Jenkins

Committee on the Uniform Designation of Hybrids

J. C. Anderson, Chairman
L. L. Huber
R. G. Wiggans

Committee on Statistical Designs for the
Uniform Comparisons

C. E. Phillips, Chairman
C. I. Bliss
H. M. Yegian

LIST OF NORTHEASTERN EXPERIMENT STATIONS

Connecticut	New Jersey
Delaware	New York
Maine	Pennsylvania
Massachusetts	Rhode Island
Maryland	Vermont
New Hampshire	West Virginia

